A NEW SPECIES OF *NEODIPHTHERA* FLETCHER (LEPIDOPTERA: SATURNIIDAE) FROM NORTHEASTERN QUEENSLAND

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Abstract

Neodiphthera sulphurea sp. n. is described from northeastern Queensland and compared with the closely related species *N. papuana* (Rothschild) and *N. albicera* (Rothschild & Jordan) from Papua New Guinea and Irian Jaya, Indonesia. *Opodiphthera goodgeri* D'Abrera is placed as a new synonym of *N. papuana*. *Neodiphthera* Fletcher is briefly discussed. *N. strigata* (Bethune-Baker), comb. n. and *N. venusta* (Rothschild & Jordan), comb. n. are newly transferred from *Opodiphthera* Wallengren.

Introduction

During the last few years a series of a variable, small species of Saturniidae has been collected in northeastern Queensland. A small series of this undescribed species is in the Australian National Insect Collection, Canberra and its distinction from the closely related species *N. papuana* (Rothschild, 1904) and *N. albicera* (Rothschild & Jordan, 1907) has been noted previously (Edwards 1996 and pers. comm.). Recent collecting has produced further specimens from Iron Range and from the Rocky River, Silver Plains, Cape York Peninsula, enabling a detailed comparison with the known species from New Guinea.

Neodiphthera sulphurea sp. n.

(Figs 1-8)

Type material. *Holotype* ♂, QUEENSLAND: Gordon Creek, Iron Range, 22.vi.1998, D.A. Lane (in Queensland Museum, Brisbane). *Paratypes*: 1 ♀, Gordon Creek, Iron Range, 13.v.1997, D.A. Lane; 15 ♂♂, same data as holotype, but 11 & 13.v.1997 & 21, 22, 23, 24, 25 & 28.vi.1998; 1 ♂, Iron Range, 9.vii.1984, D.A. Lane; 2 ♂♂, Rocky River, Silver Plains, 13.vi.1999 & 25.vi.1998, D.A. Lane; 2 ♂♂, Iron Range, Cape York Peninsula, 29.vi.1996 & 5-11.vii.1995, S.J. Johnson; 2 ♂♂, Rocky River, Silver Plains, 23 & 24.iv.2002, S.J. Johnson (all in D.A. Lane collection, Atherton); 2 ♂♂, same data as holotype, but 11 & 12.v.1997, genitalia No 514 & 515/01 Naumann; 3 ♂♂, Iron Range N.P., Gordon Cr., 500 m, on old mining track, 18.xii.1997, at MV lamp, A. Zwick, genitalia No 518/01, 829 & 830/02 Naumann; 1 ♂, Iron Range N.P., 'Rainforest Cmpgr.', 15/16.xii.1997, at MV lamp, A. Zwick (all in S. Naumann collection, Berlin); 3 ♂♂, Iron Range N.P., Gordon Cr., 500 m, on old mining track, 18.xii.1997, at MV lamp, A. Zwick; 1 ♂, Iron Range N.P., 'Rainforest Cmpgr.', 15/16.xii.1997, at MV lamp, A. Zwick (all in A. Zwick collection, Tuebingen, Germany); 1 ♂, labelled '*Antherea* (sic) sp., Townsville, Q., iii.[19]48 (or iii.[19]45)' (in Queensland Museum, Brisbane); 19 ♂♂, Iron Range, 7, 8, 9, 10, 13, 14 & 15.iv.1964, I.F.B. Common & M.S. Upton; 3 ♂♂, Iron Range, 2.i.1973 (2), genitalia No M808 & 10.v.1975 (1), M.S. Moulds; 1 ♂, Cape York Peninsula, Iron Range, 27.iv-4.v.1973, S.R. Monteith; 3 ♂♂, North Queensland, Cape York Peninsula, Claudie River, 5-16.v.1961, J. Macqueen; 1 ♂, same locality,

Figs 1-5. *Neodiphthera sulphurea* sp. n. (1-2) Holotype male, yellow form, upper and undersides; (3-4) male, pink form, upper and undersides; (5) male, yellow form variation, upperside.

26.v.1974, A. & J. d'Apice; 2 ♂♂, same locality, 12°43'S, 143°17'E, 23-31.iii.1984, B. Hacobian; 1 ♂, same locality, 13.ii.1985, E.D. Edwards & B. Hacobian; 1 ♂, Claudie River, Quinn Park, 12°43'S, 143°17'E, 12.ii.1985, E.D. Edwards & B. Hacobian; 3 ♂♂, Upper Leo Creek, McIlwraith Range, 500 m, 13°45'S, 143°22'E, 6.vii.1989 (1) & 7.vii.1989 (2), Nielsen, Edwards & Horak; 1 ♂, 1 ♀, Mango Tree, McIlwraith Range, 500 m, 13°45'S, 143°22'E, 5.vii.1989, Nielsen, Edwards & Horak; 1 ♂, Golden Nugget Creek Camp Site, McIlwraith Range, 500 m, 13°44'S, 143°20'E, 28.vi.1989, Nielsen, Edwards & Horak (all in Australian National Insect Collection, Canberra).

Description. Male (Figs 1-5). Forewing length (centre of thorax to wing apex) 40-45 mm. Eyes black. Antennae 7.5-8.2 mm long, with 23-25 segments, broadly quadripectinate except the last three to five segments, longest rami 1.4 mm long. Adults occur in two distinct colour morphs – pale lemon yellow or salmon pink; some of the yellow specimens show a heavy brown pattern on the wings but in most specimens such patterns are found only lightly. Legs of lemon colour morph are brown/yellow, those of pink morph are brown/pink. Upper thorax with a broad brown band immediately behind head, extending onto forewing costa.

Forewing with costa straight for basal two-thirds, then evenly but broadly bowed to apex; apex broadly rounded, termen slightly convex, hind margin straight and tornus rounded. Hindwing with termen unevenly rounded, tornus bowed, dorsum straight. In both colour morphs the apex and termen of both fore and hindwings are fringed with a very narrow dark yellow edging, giving the appearance of a 'silhouette' outline. Forewing upperside with costa broadly edged brown on basal half. An oblique brown band, edged grey basally, extends from apex at quarter to one-third inner margin, nearly straight but bowed at dorsum, curved inwards. A similar submedian brown line, less distinct, from a little less than half length of costa to quarter inner margin and strongly indented below cell. Eyespot at end of cell slightly elliptical, brown centre, ringed with a broad yellow, narrow white, then brown outer ring. Apex often has brown scales scattered from costal half to oblique brown band apically; this pattern is less developed than in *N. papuana* where a darker and larger marking can be found. Hindwing upperside with outwardly brown and inwardly grey postmedian wavy line extending from near apex to lower dorsum, not parallel to wing margin and meeting dorsum at one-eighth above tornus. Inner submedian brown line runs from dorsum to top of discal cell. Eyespot at end of cell much more diffuse. A series of submarginal variable brown spots, sometimes absent, runs roughly parallel to postmedian brown wavy line, midway to wing margin. Underside similar to upperside, the forewing and hindwing submedian lines prominent in cell only. Eyespots noticeably oval in shape, strongly marked by a brown outer ring.

Female (Figs 6-7). Forewing length 47 mm. Antennae with pectinations very narrow. Fore and hindwing as in male but wings more rounded, markings more distinct. Forewing termen strongly convex. Forewing oblique brown

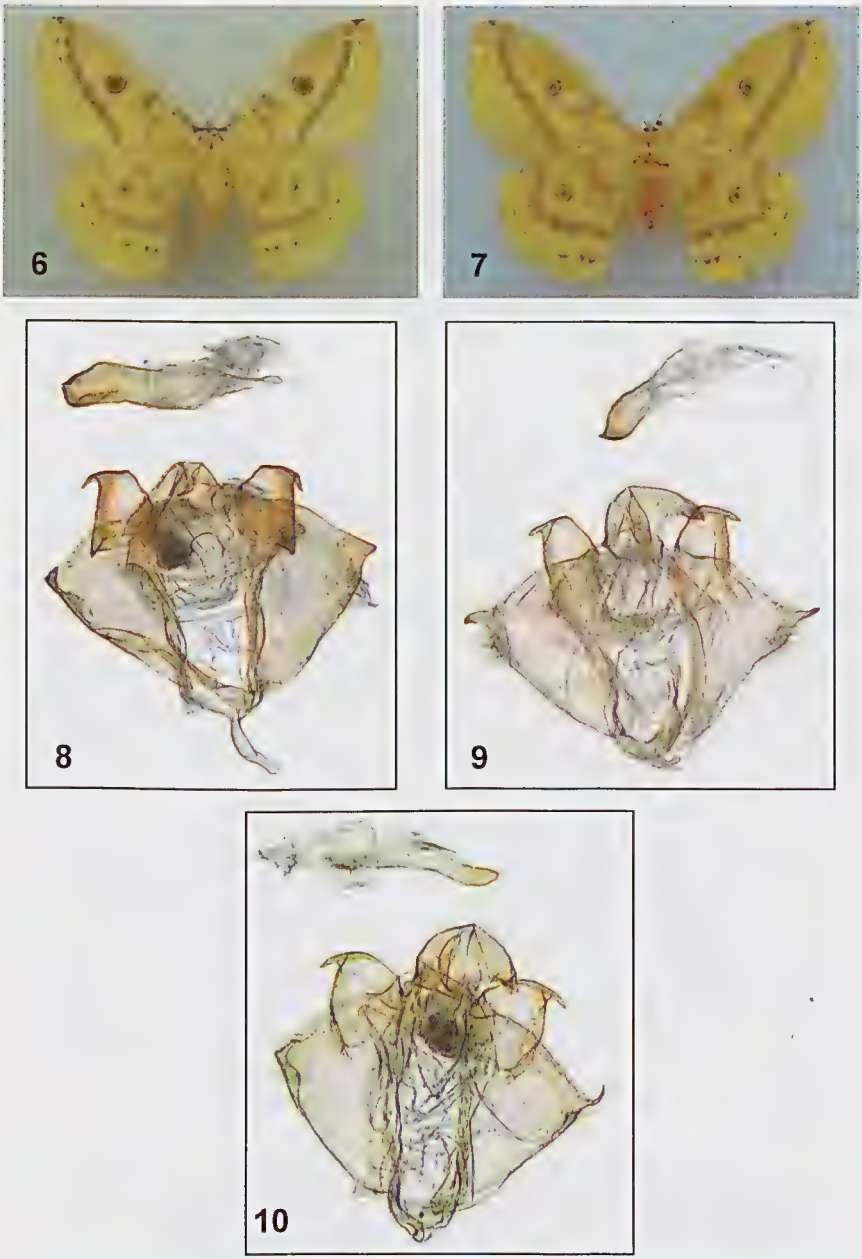
line more curved inwards towards base. Forewing eyespot larger, strongly marked with small central white spot, dark brown infill with yellow and brown outer rings. Hindwing eyespot also strongly marked, with dark brown central spot, yellow and brown outer rings. Underside similar to upperside, fore and hindwing eyespots slightly smaller, noticeably oval in shape, with distinctive inner brown, yellow and brown outer rings.

Male genitalia (Fig. 8). The genitalia are very diagnostic compared with those of the nearest relatives *N. papuana* (Fig. 9) and *N. albicera* (Fig. 10). Generally, genitalia structures within the genus look similar overall but differ constantly in the size of different parts of the genitalia and the combination of those. *N. sulphurea* has the largest and most sclerotized genitalia of all three, and the saccus and aedeagus are much longer than in both other species. The valvae have a single lateral, nearly central positioned process which is based broadly and a little sclerotized. There is a second, internal process of the valvae (= labides) with a long dorsal apical process. The uncus is long, bent, and has two short tips, the juxta has a right and left lateral dorsal process of the same length on both sides. The saccus is long and slender, the aedeagus quite long and broad for the genus, distally with a shovel-like process which is positioned right ventrolateral. In one specimen (No 830/02 Naumann) we found this structure reflected left lateral, but the rest of the structure was quite similar.

Etymology. Named after the sulphur-like appearance of adult moths, especially when viewed under a mercury vapour light source.

Distribution. Known so far only from the Iron Range and McIlwraith Range/ Rocky River, Silver Plains areas of Cape York Peninsula, northeastern Queensland. There is a specimen in the Queensland Museum labelled 'Townsville' but this locality is considered erroneous, as no similar specimens are known from rainforest areas south of Silver Plains. There is a pinkish brown female in the Australian National Insect Collection which we believe to be conspecific, with the following data: Groote Eylandt, Northern Territory, 18.v.1982, J.W.C. d'Apice & V.J. Robinson. We suspect that this specimen is incorrectly labelled, as Iron Range was also visited on the same excursion (E.D. Edwards, pers. comm.). Consequently this specimen is excluded from the type series.

Comments. N. sulphurea is closest to *N. papuana* but, apart from the genitalic differences, other noticeable features are present. Males of *N. sulphurea* are generally larger in size (FW length 42-45 mm), the forewing is broader and the hindwing more rounded than in *N. papuana*. The underside eyespot markings of *N. sulphurea* are similar to those of *N. papuana* but are distinctly oval in shape, compared with the circular shape of *N. papuana*. The oblique brown forewing line in *N. papuana* is nearly straight for its full length but in *N. sulphurea* it is generally slightly bowed and distinctly curved inwards where it meets the dorsum.



Figs 6-10. *Neodiphthera* spp. (6-7) *N. sulphurea*, female, yellow form, upper and undersides; (8) male genitalia of *N. sulphurea*, genitalia No 518/01 Naumann; (9) male genitalia of *N. papuana*, genitalia No 826/02 Naumann; (10) male genitalia of *N. albicera*, genitalia No 517/01 Naumann.

Two distinct colour morphs of *N. sulphurea* occur, as with *N. papuana*. The available females of *N. sulphurea* have the termen of the forewing strongly convex, compared with the female of *N. papuana* (in The Natural History Museum [BMNH], London) illustrated by D'Abrera (1998). The female of *N. albicera* is apparently unknown.

Nothing is known so far of the biology and life history of this species. The habitat in which adults have been collected is rich riverine lowland rain forest, with altitudinal range up to 500 metres.

Neodiphthera papuana (Rothschild)

(Fig. 9)

Opodiphthera papuana Rothschild, 1904.

Opodiphthera goodgeri D'Abrera, 1988: 24; syn. n.

Material examined. INDONESIA (IRIAN JAYA): 1 ♂, yellow morph, Paniai District, Naga Roso, Nabire, ix.1991, M. de Ridder, genitalia No 516/01 Naumann; 2 ♂♂, 1 yellow, 1 pink, Central Range near Papua border, E Gunung Mandala, Abmisibil, 1800 m, 4°47'S, 140°32'E, 6.viii.1997, B. Turlin, genitalia No 826 & 827/02 Naumann. PAPUA NEW GUINEA: 1 ♂, pink morph, in a series of 7 yellow or pink specimens, Eastern Highlands, Kainantu, Aiyura, 1700 m, 6°20'S, 145°54'E, 20.i.1998, P. Buffet, genitalia No 828/02 Naumann.

Comments. The position of both fore and hindwing eyespots is not a diagnostic feature as some variation with more proximal and more marginal eyespots occurs. D'Abrera (1998) utilised the eyespot position as a diagnostic pattern and, together with a pink instead of yellow ground colour and further (undescribed) differences in the male genitalia, described *Opodiphthera goodgeri* D'Abrera (which would belong in *Neodiphthera* in the sense of Fletcher). We examined the genitalia of one paratype of this taxon (in The Natural History Museum, London), plus genitalia of both yellow and pink males of *N. papuana* from localities in western and eastern Irian Jaya (Indonesia) and eastern Papua New Guinea in the collection of S. Naumann and found no discernable differences. Both taxa were collected together in Irian Jaya and Papua New Guinea and, as shown for *N. sulphurea*, different colour morphs evidently occur intraspecifically in this genus. Therefore, we regard *N. goodgeri* as a pinkish colour morph and new synomyn of *N. papuana*.

Discussion

Some taxonomic problems were encountered with placing the new species in the correct genus. Bouvier (1936) was the first to propose a new generic name for a group of species formerly included in *Opodiphthera* Wallengren, 1858, but cited certain species twice in his work, both under *Opodiphthera* and his new genus *Neodiphthera*, and failed to designate a type species for the new genus. Therefore the description is not valid in the sense of the Code and the name *Neodiphthera* Bouvier is not available.

Fletcher (1982) later validly redescribed the genus *Neodiphthera* as new, citing *Opodiphthera papuana* Rothschild, 1904 as the type species. Unfortunately he gave no further notes on the genus, or suggestion as to which other species should be placed in it. It is unclear if he wanted conformity with Bouvier, who included species related to *O. sciron* (Westwood, 1881) (with uniformly brown males and dark grey females; only the very eastern representatives *O. decellei* Lemaire & Naessig, 2002 from Bougainville and *O. tennenti* Naessig & Lemaire, 2002 from Guadalcanal in the Solomon Islands show a more colourful pattern), plus *O. papuana* and related species (a group of smaller, mostly yellow species), or if he proposed the name only for the latter. Little has been published subsequently on the genus *Neodiphthera*.

Naessig and Holloway (1988) cited *Neodiphthera* at the same rank as other Australasian genera of Saturniidae. They discussed briefly the monophyly of the whole group owing to their very similar genitalic structures and noted that a revision of the group was needed. Edwards (1996) was the first to mention the new Australian species described here, citing it as '*Neodiphthera* sp. A'. The genus was not mentioned by Common (1990).

D'Abrera (1998) did not cite *Neodiphthera* Fletcher in his work on the world Saturniidae but placed all possible members in *Opodiphthera*. His heading '*Opodiphthera* Wallengren, 1858 = *Neodiphthera* Auctt.' does not represent synonymisation in the sense of the Code, but application of a generic name for a group of species with currently unclear taxonomic status. Finally, Naumann and Brechlin (2001) compared genitalia structures of the genera *Syntherata* Maassen, 1873, *Opodiphthera* and *Neodiphthera* and found many similarities, but not consistent with the current generic classification. They also suggested that a taxonomic revision was needed, with a critical reorganization of the three genera involved, in light of knowledge about early instars, behaviour and genitalic structures.

Owing to the close relationship between *N. sulphurea*, *N. papuana* and *N. albicera*, plus *N. strigata* (Bethune-Baker, 1908), comb. n. and *N. venusta* (Rothschild & Jordan, 1907), comb. n., we here include those five species within the genus. We do not intend to undertake further taxonomic changes without much needed scientific investigations and we therefore hesitate to include within *Neodiphthera* the species related to *O. sciron*; further studies with more material are necessary.

Males of *N. papuana* and *N. albicera* are readily separated. *N. albicera* is generally a much smaller species (forewing length 33-35 mm) compared with *N. papuana* (forewing length 38-40 mm). Males of *N. albicera* have relatively more elongate and narrower forewings, with the apex more distinctly acute. The ground colour is a lighter pale yellow. On the underside, the eyespots are circular in shape, distinctly core filled white instead of yellow to orange as in *N. papuana*, with a small brown spot at centre, and a brown outer ring, as

described in the original description of *N. albicera* (Rothschild and Jordan 1907) and evidently shown by D'Abrera (1998). Further differences are the brown pattern on the underside of *N. albicera*, instead of a more greyish one in *N. papuana*, and the male genitalia; those of *N. albicera* are much smaller, with only a small, nearly reduced saccus and very short aedeagus; the dorsal lateral processes of the juxta are shorter than in *N. papuana* and the process of the valva is quite slender and tapering, as with the dorsal process of the labides. The uncus is shortest in *N. albicera*. The genitalia of *N. papuana* (Fig. 9) show approximately intermediate characters between those of *N. albicera* (Fig. 10) and *N. sulphurea* (Fig. 8).

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